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ABSTRACT

Between their second and fifth years, young children learn approximately 15 new words a day. For every word the child hears, he or she must choose the correct referent out of an infinite set of candidates. An important problem for developmental psychologists is to understand the principles that limit the child's hypotheses about word meanings. A total of 24 children, mean age 2 years and 1 month, were taught new nouns referring to objects and nonsolid substances. In one condition, the syntax used by the experimenter selected for either a count or a mass noun. In another condition, the syntax was not selective. The subjects' interpretation of the newly taught word was evaluated through a pointing procedure. Results revealed that children's inferences about word reference were dependent upon the status of the stimulus as an object, regardless of the presence or absence of selective syntax. If the stimulus was an object, the word was assumed to be a sortal term referring to a type of object. If the stimulus was not an object, it was considered to be a type of substance. Two considerations suggest that use of the concept of object in assigning word reference does not depend on the subject's knowledge of count/mass syntax. First, the results from the two conditions were equivalent. Second, performance in the task was independent of production of count/mass syntax, as analyzed from speech samples collected from each child. (Author/RH)

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CONSTRAINTS ON THE MEANINGS OF WORDS

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ABSTRACT

Between their second and fifth years young children learn approximately 15 new words a day. For every word the child hears he has to choose the correct referent out of an infinite set of candidates. An important problem for developmental psychologists is to understand the principles that limit the child's hypotheses about word meanings.

24 children, mean age 2:1, were taught new nouns referring to objects and non-solid substances. In one condition the syntax used by the experimenter selected for either a count or a mass noun (a blicket, some blicket). In another condition the syntax was not selective (my blicket). The subjects' interpretation of the newly taught word was evaluated through a pointing procedure.

The results revealed that children's inferences about word reference were dependent upon the stimulus' status as an object (regardless of the presence or absence of selective syntax). The word was assumed to be a sortal term referring to a type of object if the stimulus was an object and a type of substance otherwise.

Two considerations suggest that use of the concept of object in assigning word reference does not depend on the subject's knowledge of count/mass syntax. First, the results from the two conditions were equivalent. Second, performance in the task was independent of production of count/mass syntax, as analyzed from speech samples collected from each child.

MOTIVATION

Two-year-olds learn approximately 15 new words a day. For each of these words the child must choose the correct meaning from an infinite set of logical possibilities. If a child hears "that's a cup" when the speaker is indicating a brown, plastic cup half-filled with coffee, "cup" could refer to brown, plastic, coffee, being half full, the front side of the cup and the table, the handle, any undetached part of a cup, the cup at that particular moment in time, the cup, etc. Children's hypotheses must be highly constrained to converge on the correct meaning efficiently. Our study tests the following claims:

Claim 1: inter alia, young toddlers conceptualize the world in terms of types of physical objects and types of non-solid substances.

Claim 2: These two concepts --type of object and type of substance-- facilitate children's inductions about word reference.

There are two reasons these two hypotheses are not self-evident. First, the literature on infants' categorization skills shows them to be sensitive to all sorts of features of the world --color, shape, prototype structure in classes of two dimensional figures, etc. All of these features are potential sources of hypotheses about word meanings. Second, Quine has suggested that until the child learns the syntax of quantification (determiners, plurals, and quantifiers such as numbers and "some", "much", "many", and "another"), the child does not make the distinction between kinds of objects and kinds of stuff. This, of course, is an empirical question, the empirical question we are addressing here.

SUBJECTS

In each group (neutral and syntax) there were 12 subjects, age 1:10 - 2:3 (mean age 2:1). They were recruited from the greater Boston area. Testing was started with three other subjects but not finished. The latter three had no understanding of the task and could barely get through each trial. Testing was conducted at the subjects' homes. Subjects received $5.00 each for their participation.

PROCEDURE

There were two conditions, neutral and syntax, and two types of trials, object trials and substance trials. Condition was a between subjects factor and trial type was a within subjects factor. Each subject received one warm-up trial with a familiar object (e.g., a cup) and one warm-up trial with a familiar non-solid substance (e.g., peanut butter). He then had eight experimental trials: four with unfamiliar objects and four with unfamiliar non-solid substances.

An Object Trial (The Neutral Condition)

1. The first stimulus presented was an object. (An example is a metal plumbing "t".)

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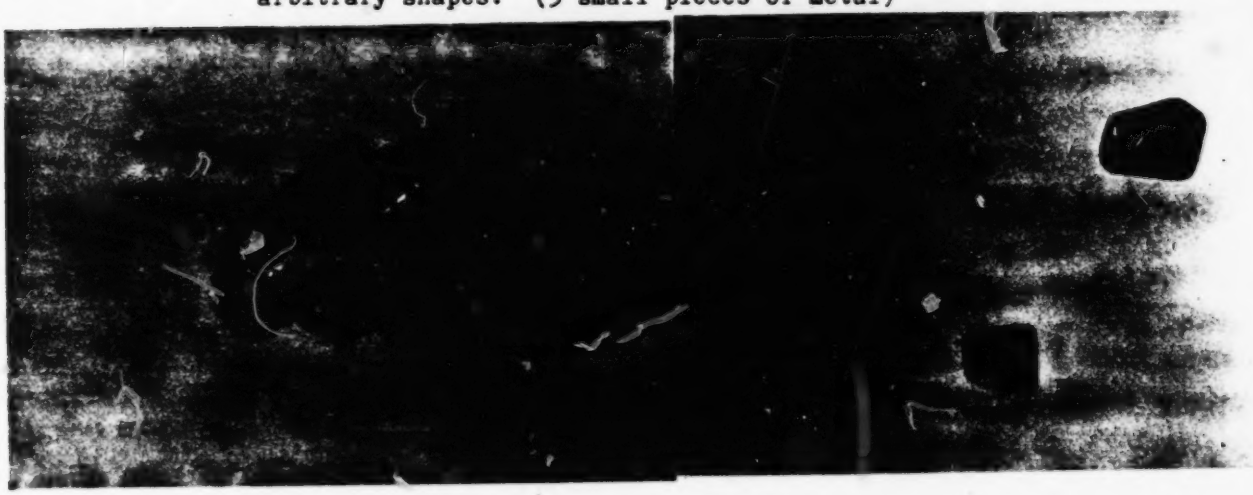
2. The stimulus was given a name. (For example, the E said, "This is my blicket.") The E then continued to talk about the object using "my", "the", and "this" for determiners. She manipulated the stimulus and encouraged the S to do so also.

3. Two further stimuli were simultaneously presented.

   - One was a single object of the same object type as the original, but made out of a different material. (a plastic "t")

   - The other was a set of objects containing 3 chunks of the same material as the original object. They were small and in arbitrary shapes. (3 small pieces of metal)



4. The E said, "Point to the blicket".

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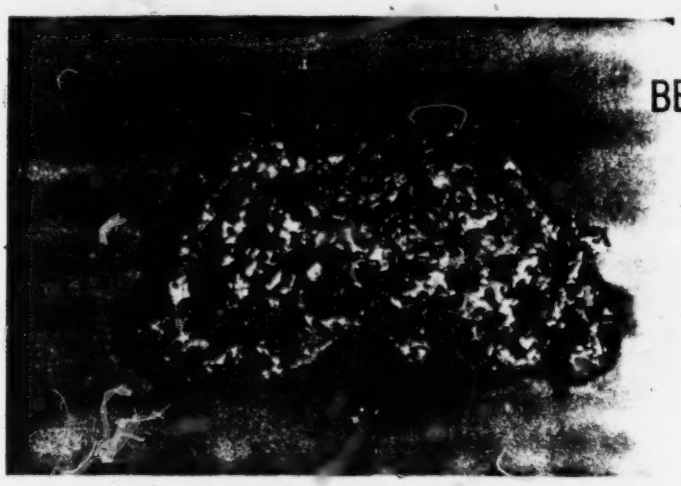
An Object Trial (Syntax Condition)

This trial is exactly the same as above except that in step 2 the determiners were selective (for example, "a blicket" & "another blicket").

A Substance Trial (Neutral Condition)

1. The first stimulus presented was a non-solid substance in a single big pile. (An example is Nivea hand cream mixed with gravel.)



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2. The stimulus was given a name. (For example, the E said, "This is my stad.") The E then continued to talk about the object using "my", "the", and "this" for determiners. She manipulated the stimulus and encouraged the S to do so also.

3. Two further stimuli were simultaneously presented.

   - One was in 1 big pile, but was a novel substance. (Dippity Do, a hair setting gel, in a big pile)

   - The other was the original substance in 3 small piles. (Nivea in 3 small piles)

4. The E said, "Point to the stad".

A Substance Trial (Syntax Condition)

This trial is exactly the same as above except that in step 2 the determiners were selective (for example, "blicket" & "some blicket").

SCORING

If children assume that a word used to describe an object refers to that type of object (i.e., is a sortal term for that object), then on object trials they should choose another object of the same type as the original, ignoring the change in material. They should not choose the multiple chunks of the material, for these do not constitute an object at all, let alone the same kind of object as the original. In the substance trials, in contrast, there is no object to which the word could refer. If children assume that words used to describe non-solid substances refer to that type of substance, then they should choose another example of the original substance, ignoring the change in number and size of piles. Such responses are deemed correct. Note that to be correct on an object trial, the child must choose the new stimulus matching the original in number and shape and to be correct on a substance trial, the child must choose the new stimulus differing from the original in shape and in number of piles or chunks. For each subject the total number of correct responses on object trials and on substance trials were separately tabulated.

Before and after testing, an experimenter played with the subject. The entire period of involvement with the subject was tape recorded. The subjects' noun phrases during the play periods were transcribed and organized according to noun subcategorization. Noun phrases were scored as correct if obligatory determiners were present and if the determiner was consistent with the noun (as is "the table" or "a table" but not *"a sand" or *"a tables"). The percent of correct noun phrases for each subject was found.

RESULTS

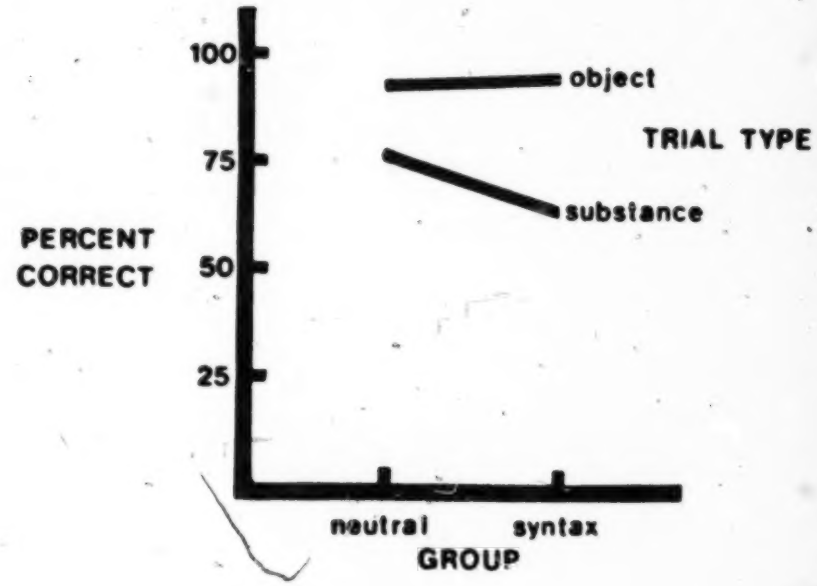
Object and Substance Scores

1. The subjects did better than chance on both object trials and substance trials (o: t = 23.3, df = 23, p < .0000002, 2-tailed, r = .98; s: t = 3.66, df = 23, p < .002, r = .61).

2. They did better on the former than the latter (F = 23(1,22), p < .001, 2-tailed, eta = .73).

3. All other factors, most importantly group (neutral or syntax), did not affect responses (all F's < 2.2, p's > .15, 2-tailed, eta's < .31).

GROUP	TRIAL TYPE: object	TRIAL TYPE: substance
neutral	93%	76%
syntax	94%	63%



Production Data

1. There was no difference in the production skills, as measured by this score, between the neutral and syntax groups (F = .4(1,20), p = .5, 2-tailed, eta = .14).

2. This measure of the use of count/mass syntax did not correlate with object or substance scores (o: r = .15; s: r = .11).

DISCUSSION

The data support both claims. Two-year-olds appear to conceptualize the world in terms of types of objects and types of non-solid substances. The stimulus' status as an object determined how the subjects assigned word reference: so long as the stimulus was a physical object, they assumed the word referred to the type of object. Otherwise, they assumed that the word referred to the type of substance, although they were significantly less sure of this inference. Furthermore, they followed the same procedure regardless of the level of their knowledge of count/mass syntax.

Subjects did not benefit from the addition of count/mass syntax. Two-year-olds use qualities of the stimulus and not of the noun's subcategorization as evidence about the word's referent.

TOPICS FOR DISCUSSION

1. The children were less skilled at learning names for substances than names for objects. What are the implications of this finding? Additional information --or information of a different sort-- may facilitate word learning with substances. However, this result does not affect the standing of the two claims. The subjects selected the original substance type in the substance trials significantly more often than chance, and that is the key to the argument in support of the hypotheses.

2. An alternative interpretation (currently being tested in our laboratory) is that responses were determined by overall similarity rather than ontological type (object or non-solid substance). Since the shapes were more distinctive in the object trials than in the substance trials, further research is required to disentangle distinctiveness of shape and solidity.

3. Much of the child's early vocabulary refers to types of objects. Doesn't this fact already support the two claims? No, for one thing we do not know the time course of mapping words onto referents (i.e., we do not know whether the child's first hypothesis is that the word refers to a type of object). Secondly, we do not know for sure that the child does not take the word simply to refer to a distinctive shape.

4. The constraints on word meanings, as we now conceive of them, have the consequence that the child should have great conceptual problems with the ontological type --solid substance. Is there evidence that children have a hard time learning words like "wood", "metal", and "plastic"? We think so.